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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,942	03/05/2002	Jing-Horng Gan	JCLA8556	7093

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EXAMINER

WARREN, MATTHEW E.

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 05/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/091,942

Applicant(s)

GAN ET AL.

Examiner

Matthew E. Warren

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13 and 28-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-13 is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-9 and 14 is/are rejected.
- 7) ☒ Claim(s) 6, 29 and 30 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This Office Action is in response to the Remarks filed on January 14, 2004.

#### ***Claim Objections***

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 14-16 have been renumbered 28-30.

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7-9, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's Prior Art Figure 6 (APAF) in view of Lebowitz (US 4,694,561).

In re claim 1, the APAF 6 shows a variable capacitor structure comprising a substrate (100), a first-type ion-doped well (104) in the substrate and a buried layer (102) in the substrate underneath the first type ion-doped well. The first type ion-doped

buried layer and the first type ion-doped well are connected. There is a second type ion-doped region (120) at the bottom of the cavity of the first ion-doped well. A conductive layer (28 or 30) is formed over the first type ion-doped buried layer, wherein the conductive layer and the first type ion-doped layer are connected (indirectly through contact with the second type ion-doped region and the first-type ion-doped well). The APAF shows all of the elements of the claims except the first type ion-doped well having a cavity. Lebowitz discloses (col. 1, lines 30-65) that trenches (or cavities) have been formed into substrates as capacitors to achieve specific values of capacitance and increase the density of capacitors in an array. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the variable capacitor of the APAF 6 by forming the capacitor in the bottom of a trench as taught by Lebowitz to achieve high capacitance values increase the density of capacitors in an array.

In re claim 2, the APAF 6 shows a metal silicide over the second type ion region.

In re claim 3, the APAF 6 shows that the conductive layer (30) includes a second type ion doped deep collector region (20).

In re claim 4, the APAF 6 shows a second metal silicide (24) over the second type ion doped deep collector region.

In re claim 5, the APAF 6 shows that the conductor (28) is a contact.

In re claim 7, the APAF 6 shows that the structure further includes a second metal silicide layer between the first type ion-doped buried layer and the conductive layer.

In re claim 8, the APAF 6 shows that the structure further includes an isolation structure (16) within the first type ion-doped well between the second type ion-doped region (18) and the conductive layer (30).

In re claim 9, the APAF 6, shows that the first type ion-doped buried layer is an N-type buried layer (12) and the second type ion-doped region is a P-doped region (18).

In re claim 28, the APAF 6, shows that the contact is isolated from the second type ion-doped region through an insulation layer (15).

***Allowable Subject Matter***

Claims 6, 29, and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 10-13 are allowed.

The following is an examiner's statement of reasons for allowance: the prior art references, alone or in combination, do not show a variable capacitor structure comprising a second type ion-doped region in a first type ion-doped well at the bottom of a trench isolation structure and a first conductive layer connected to the first type ion-doped buried layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Response to Arguments***

Applicant's arguments filed with respect to claims 1-16 have been fully considered but they are not persuasive. The applicant primarily asserts that the trench capacitor of Lebowitz cannot be combined with the variable capacitor of the Applicant's Prior Art Figure 6 (APAF) because Lebowitz is not analogous and lacks the proper motivation. The examiner believes that Lebowitz is an analogous reference because the technology described therein pertains to capacitors formed in semiconductors. Although Lebowitz pertains to a DRAM capacitor and the APAF pertains to a variable capacitor, both prior art references generally deal with providing a capacitor in semiconductor device. Thus, the references are analogous.

The examiner also believes that Lebowitz provides proper motivation despite the fact that the reason to use the trenches of Lebowitz differs from the applicant's motivation. It is not a requirement that the examiner's statement of motivation be the same as the applicant's motivation. It is required that the prior art reference show some reason or benefit from the desired teaching. In this case, Lebowitz uses the shallow trench to increase capacitance. If one desired to increase the capacitance of a variable capacitor, one would look to Lebowitz to show that trenches formed in a substrate increase capacitance. The applicant has merely discovered additional benefits of forming a trench capacitor in that it also reduces the resistance. In essence, Lebowitz shows motivation for forming a trench capacitor and the combination of references is still proper. The cited references show all of the elements of the claims and this action is made final.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thurs, and alternating Fri, 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEW  
*MEW*  
May 14, 2004

*Tom Thomas*  
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